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ART UNIT	PAPER NUMBER
2168	

DATE MAILED: 12/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/610,961	KEKRE ET AL.	
	Examiner	Art Unit	
	Mahesh H. Dwivedi	2168	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-13,15 and 18-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-13,15 and 18-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/02/2006 has been entered.

Remarks

2. Receipt of Applicant's Amendment filed on 10/02/2006 is acknowledged. The amendment includes amending claims 1, 15, and 23, and the cancellation of claims 2, 3, 14, 16, 17, and 27-29.

Specification

3. The disclosure is objected to because of the following informalities: Attorney Docket Number at paragraph 13 should be replaced with the Application serial number and its current status.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 6 recites the limitation "said preserving" in page 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 7 is rejected for incorporating the deficiencies of claim 6.

Claim 13 recites the limitation "said preserving" in page 4. There is insufficient antecedent basis for this limitation in the claim.

Claim 20 recites the limitation "said preserving" in page 5. There is insufficient antecedent basis for this limitation in the claim.

Claim 21 is rejected for incorporating the deficiencies of claim 6.

Claim 26 recites the limitation "said preserving" in page 4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1, 4-5, 8-12, 15, 18-19, and 22-25 rejected under 35 U.S.C. 103(a) as being unpatentable over **Milillo et al.** (U.S. Patent 6,643,671) and in view of **Veritas** (Article entitled "Veritas Flashsnap Point-in-Time Copy Solutions", dated 06/24/2002.

9. Regarding claim 1, **Milillo** teaches a method comprising:

A) maintaining first and second data volumes, wherein the first data volume is unrelated to the second data volume (Column 5, lines 56-60);

B) refreshing the second data volume to data of the first data volume so that the second data volume becomes a point-in-time (PIT) copy of the first data volume (Column 7, lines 44-49, Column 8, lines 13-28);

C) wherein refreshing the second data volume comprises overwriting all data of the second data volume with data copied from the first data volume (Column 7, lines 44-49, Column 8, lines 13-28);

The examiner notes that **Milillo** teaches **"maintaining first and second data volumes, wherein the first data volume is unrelated to the second data volume"** as "In a PPRC system, volume pairs are designated in which a storage volume in the primary system is paired with a storage volume in the secondary system, which together may be referred to as an established PPRC volume pair" (Column 5, lines 56-60). The examiner further notes that it is common knowledge that in order for a PPRC volume pair to have volumes which become linked to one another, they were initially unlinked to one another (see "established PPRC volume pair"). The examiner further notes that

Milillo teaches **"refreshing the second data volume to data of the first data volume so that the second data volume becomes a point-in-time (PIT) copy of the first data volume"** as "when a user wants to snapshot copy from simplex source volume 52 to PPRC volume pair 54, 56 in order to migrate backup data to secondary subsystem 48...Upon establishment of the PPRC pair 54, 56, an internal snapshot copy is used to synchronize the source 52 and the primary target 54 volumes" (Column 8, lines 15-26). The examiner further notes that **Milillo** teaches **"wherein refreshing the second data volume comprises overwriting all data of the second data volume with data copied from the first data volume"** as "when a user wants to snapshot copy from simplex source volume 52 to PPRC volume pair 54, 56 in order to migrate backup data to secondary subsystem 48...Upon establishment of the PPRC pair 54, 56, an internal snapshot copy is used to synchronize the source 52 and the primary target 54 volumes" (Column 8, lines 15-26).

Milillo does not explicitly teach:

D) modifying data of the first data volume before any or all data of the second data volume is overwritten with data copied from the first data volume; and

E) modifying data of the second data volume before any or all data of the second data volume is overwritten with data copied from the first data volume.

Veritas, however, teaches **"modifying data of the first data volume before any or all data of the second data volume is overwritten with data copied from the first data volume"** as "Resynchronize the snapshot from the original volume—updates the snapshot with data from the primary volume that has changed since the snapshot

was taken" (Page 15, Section: Choices for Snapshot Resynchronization) and **"modifying data of the second data volume before any or all data of the second data volume is overwritten with data copied from the first data volume"** as "Resynchronize the original volume from the snapshot—updates the original volume with data from the snapshot volume that has changed since the snapshot was taken" (Page 15, Section: Choices for Snapshot Resynchronization).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 4, **Milillo** does not explicitly teach a method comprising:
A) creating one or more PIT copies of the first data volume prior to refreshing the second data volume to the data contents of the first data volume.

Veritas, however, teaches **"creating one or more PIT copies of the first data volume prior to refreshing the second data volume to the data contents of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas** creates multiple mirrors of primary volumes before refreshing the primary volume onto a secondary volume.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 5, **Milillo** does not explicitly teach a method comprising:
A) wherein one of the PIT copies of the first data volume is in a virtual state when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein one of the PIT copies of the first data volume is in a virtual state when the second data volume is refreshed to the data of the first data volume"** as "The presence of the FastResync map means that only those updates that the mirror has missed need to be reapplied to resynchronize it with the volume. A full, and thereby much slower, resynchronization of the mirror form the volume is unnecessary" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** snapshot mirrors are virtual in that they contain data stored in the primary volume (see only updated data is migrated to the mirror for resynchronization). The examiner further notes that it is common knowledge that Flashsnap creates virtual point-in-time copies of volumes.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in

resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 8, **Milillo** does not explicitly teach a method comprising:

A) wherein the first data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein the first data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes...Use vxassist snapshot to create snapshot volumes from the snapshot mirrors" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas** has the snapshot volume refreshed to the state of the snapshot mirror, wherein the snapshot mirror is a point-in-time copy of the volume.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 9, **Milillo** further teaches a method comprising:

A) wherein the second data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume (Column 5, lines 55-60.

The examiner notes that **Milillo** teaches **"wherein the second data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume"** as "In a PPRC system, volume pairs are designated in which a storage volume in the primary system is paired with a storage volume in the secondary system, which together may be referred to as an established PPRC volume pair" (Column 5, lines 56-60). The examiner further notes that it is common knowledge that in order for a PPRC volume pair to have volumes which become linked to one another, they were initially unlinked to one another (see "established PPRC volume pair"). The examiner further notes that Figure 3 shows multiple secondary volumes which are snapshots of other primary volumes.

Regarding claim 10, **Milillo** does not explicitly teach a method comprising:

A) generating first and second maps in memory;

B) wherein each of the first and second maps comprises a plurality of entries;

C) wherein each entry of the first map corresponds to a respective memory block that stores data of the first data volume; and

D) wherein each entry of the second map corresponds to a respective memory block that stores data of the second data volume.

Veritas, however, teaches **"generating first and second maps in memory"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), **"wherein each of the first and second maps comprises a plurality of entries"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), **"wherein each entry of the first map corresponds to a respective memory block that stores data of the first data volume"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), and **"wherein each entry of the second map corresponds to a respective memory block that stores data of the second data volume"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** maps have a plurality of entries and track changes to both the primary volume and the snapshot volume (see "keep track of which blocks are updated in the volume and in the snapshot").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 11, **Milillo** does not explicitly teach a method comprising:
A) setting a first bit in each entry of the first map, wherein each first bit of the first map is set to indicate its respective memory block stores valid data;
B) clearing a first bit in each entry of the second map, wherein each first bit of the second map is set to indicate its respective memory block stores invalid data.

Veritas, however, teaches **"setting a first bit in each entry of the first map, wherein each first bit of the first map is set to indicate its respective memory block stores valid data"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), and **"clearing a first bit in each entry of the second map, wherein each first bit of the second map is set to indicate its respective memory block stores invalid data"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent

FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** maps have a plurality of entries and track changes to both the primary volume and the snapshot volume (see "keep track of which blocks are updated in the volume and in the snapshot").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 12, **Milillo** does not explicitly teach a method comprising:
A) setting or clearing a second bit in each entry of the second map to indicate that its respective memory block stores data needed for a PIT copy of the second data volume.

Veritas, however, teaches **"setting or clearing a second bit in each entry of the second map to indicate that its respective memory block stores data needed for a PIT copy of the second data volume"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** maps have a plurality of entries and track changes to both the primary volume and the snapshot volume (see "keep track of which blocks are updated in the volume and in the snapshot").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 15, **Milillo** teaches a computer readable medium comprising:

A) refreshing a second data volume to the data of a first data volume so that the second data volume becomes a PIT copy of the first data volume (Column 7, lines 44-49, Column 8, lines 13-28);

B) wherein refreshing the second data volume comprises overwriting all data of the second data volume with data copied from the first data volume (Column 7, lines 44-49, Column 8, lines 13-28); and

C) wherein the first data volume is unrelated to the second data volume prior to refreshing the second data volume to the data of the first data volume (Column 5, lines 56-60).

The examiner notes that **Milillo** teaches **"refreshing the second data volume to data of the first data volume so that the second data volume becomes a point-in-time (PIT) copy of the first data volume"** as "when a user wants to snapshot copy

from simplex source volume 52 to PPRC volume pair 54, 56 in order to migrate backup data to secondary subsystem 48...Upon establishment of the PPRC pair 54, 56, an internal snapshot copy is used to synchronize the source 52 and the primary target 54 volumes" (Column 8, lines 15-26). The examiner further notes that **Milillo** teaches **"wherein refreshing the second data volume comprises overwriting all data of the second data volume with data copied from the first data volume"** as "when a user wants to snapshot copy from simplex source volume 52 to PPRC volume pair 54, 56 in order to migrate backup data to secondary subsystem 48...Upon establishment of the PPRC pair 54, 56, an internal snapshot copy is used to synchronize the source 52 and the primary target 54 volumes" (Column 8, lines 15-26). The examiner further notes that **Milillo** teaches **"wherein the first data volume is unrelated to the second data volume prior to refreshing the second data volume to the data of the first data volume"** as "In a PPRC system, volume pairs are designated in which a storage volume in the primary system is paired with a storage volume in the secondary system, which together may be referred to as an established PPRC volume pair" (Column 5, lines 56-60). The examiner further notes that it is common knowledge that in order for a PPRC volume pair to have volumes which become linked to one another, they were initially unlinked to one another (see "established PPRC volume pair").

Milillo does not explicitly teach:

D) modifying data of the first data volume before any or all data of the second data volume is overwritten with data copied from the first data volume; and

E) modifying data of the second data volume before any or all data of the second data volume is overwritten with data copied from the first data volume.

Veritas, however, teaches **"modifying data of the first data volume before any or all data of the second data volume is overwritten with data copied from the first data volume"** as "Resynchronize the snapshot from the original volume—updates the snapshot with data from the primary volume that has changed since the snapshot was taken" (Page 15, Section: Choices for Snapshot Resynchronization) and **"modifying data of the second data volume before any or all data of the second data volume is overwritten with data copied from the first data volume"** as "Resynchronize the original volume from the snapshot—updates the original volume with data from the snapshot volume that has changed since the snapshot was taken" (Page 15, Section: Choices for Snapshot Resynchronization).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 18, **Milillo** does not explicitly teach a computer readable medium comprising:

A) wherein the method further comprises creating one or more PIT copies of the first data volume prior to refreshing the second data volume to the data of the first data volume.

Veritas, however, teaches **"wherein the method further comprises creating one or more PIT copies of the first data volume prior to refreshing the second data volume to the data of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas's** creates multiple mirrors of primary volumes before refreshing the primary volume onto a secondary volume..

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 19, **Milillo** does not explicitly teach a computer readable medium comprising:

A) wherein one of the PIT copies of the first data volume is in the virtual state when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein one of the PIT copies of the first data volume is in the virtual state when the second data volume is refreshed to the**

data of the first data volume" as "The presence of the FastResync map means that only those updates that the mirror has missed need to be reapplied to resynchronize it with the volume. A full, and thereby much slower, resynchronization of the mirror form the volume is unnecessary" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** snapshot mirrors are virtual in that they contain data stored in the primary volume (see only updated data is migrated to the mirror for resynchronization). The examiner further notes that it is common knowledge that Flashsnap creates virtual point-in-time copies of volumes.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 22, **Milillo** does not explicitly teach a computer readable medium comprising:

A) wherein the first data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein the first data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes...Use vxassist snapshot

to create snapshot volumes from the snapshot mirrors" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas** has the snapshot volume refreshed to the state of the snapshot mirror, wherein the snapshot mirror is a point-in-time copy of the volume.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 23, **Milillo** further teaches a computer readable medium comprising:

A) wherein the second data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume (Column 5, lines 55-60.

The examiner notes that **Milillo** teaches **"wherein the second data volume is a real or virtual PIT copy of another data volume when the second data volume is refreshed to the data of the first data volume"** as "In a PPRC system, volume pairs are designated in which a storage volume in the primary system is paired with a storage volume in the secondary system, which together may be referred to as an established PPRC volume pair" (Column 5, lines 56-60). The examiner further notes that it is

common knowledge that in order for a PPRC volume pair to have volumes which become linked to one another, they were initially unlinked to one another (see "established PPRC volume pair"). The examiner further notes that Figure 3 shows multiple secondary volumes which are snapshots of other primary volumes.

Regarding claim 24, **Milillo** does not explicitly teach a computer readable medium comprising:

A) wherein refreshing the second data volume further comprises generating first and second maps in memory;

B) wherein each of the first and second maps comprises a plurality of entries;

C) wherein each entry of the first map corresponds to a respective memory block that stores data of the first data volume; and

D) wherein each entry of the second map corresponds to a respective memory block that stores data of the second data volume.

Veritas, however, teaches **"wherein refreshing the second data volume further comprises generating first and second maps in memory"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), **"wherein each of the first and second maps comprises a plurality of entries"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of

Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), **"wherein each entry of the first map corresponds to a respective memory block that stores data of the first data volume"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), and **"wherein each entry of the second map corresponds to a respective memory block that stores data of the second data volume"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** maps have a plurality of entries and track changes to both the primary volume and the snapshot volume (see "keep track of which blocks are updated in the volume and in the snapshot").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 25, **Milillo** does not explicitly teach a computer readable medium comprising:

A) clearing a first bit in each entry of- the first map, wherein each first bit of the first map is set to indicate its respective memory block stores valid data;

B) setting a first bit in each entry of the second map, wherein each first bit of the second map is set to indicate its respective memory block stores invalid data.

Veritas, however, teaches **"clearing a first bit in each entry of- the first map, wherein each first bit of the first map is set to indicate its respective memory block stores valid data"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots), and **"setting a first bit in each entry of the second map, wherein each first bit of the second map is set to indicate its respective memory block stores invalid data"** as "VxVM uses a FastResync map to keep track of which blocks are updated in the volume and in the snapshot" (Page 7, Section: FastResync of Volume Snapshots) and "Non=-Persistent FastResync stores its change maps in memory" (Page 7, Section: FastResync of Volume Snapshots).

The examiner notes that it is clear that **Veritas's** maps have a plurality of entries and track changes to both the primary volume and the snapshot volume (see "keep track of which blocks are updated in the volume and in the snapshot").

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

10. Claims 6-7, 13, 20-21, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Milillo et al.** (U.S. Patent 6,643,671) and in view of **Veritas** (Article entitled "Veritas Flashsnap Point-in-Time Copy Solutions", dated 06/24/2002 as applied to claims 1, 4-5, 8-12, 15, 18-19, and 22-25 and in view of **DeKoning** (U.S. Patent 6,691,245).

11. Regarding claim 6, **Milillo** and **Veritas** do not explicitly teach a method comprising:

A) wherein said preserving comprises creating one or more PIT copies of the second data volume prior to refreshing the second data volume to the data contents of the first data volume.

DeKoning, however, teaches **"wherein said preserving comprises creating one or more PIT copies of the second data volume prior to refreshing the second data volume to the data contents of the first data volume"** as "An incremental snapshot of the mirrored data is generated on the secondary storage device at the predetermined checkpoint indicated by the checkpoint message...Thus, the incremental snapshot maintains the storage state of the secondary storage device at the predetermined checkpoint" (Column 2, lines 59-67-Column 3, lines 10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **DeKoning's** would have allowed **Milillo's** and **Veritas's** to improve efficiency in dealing with synchronization through volume preservation, as noted by **DeKoning** (Column 2, lines 1-5).

Regarding claim 7, **Milillo** does not explicitly teach a method comprising:
A) wherein one of the PIT copies of the second data volume is in the virtual state when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein one of the PIT copies of the second data volume is in the virtual state when the second data volume is refreshed to the data of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes...Use vxassist snapshot to create snapshot volumes from the snapshot mirrors" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas** has the snapshot volume refreshed to the state of the snapshot mirror, wherein the snapshot mirror is a point-in-time copy of the volume.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in

resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 13, **Milillo** and **Veritas** do not explicitly teach a method comprising:

A) wherein said preserving comprises creating a PIT copy of the second data volume before or while refreshing the second data volume to the data contents of the first data volume.

DeKoning, however, teaches **"wherein said preserving comprises creating a PIT copy of the second data volume before or while refreshing the second data volume to the data contents of the first data volume"** as "An incremental snapshot of the mirrored data is generated on the secondary storage device at the predetermined checkpoint indicated by the checkpoint message...Thus, the incremental snapshot maintains the storage state of the secondary storage device at the predetermined checkpoint" (Column 2, lines 59-67-Column 3, lines 10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **DeKoning's** would have allowed **Milillo's** and **Veritas's** to improve efficiency in dealing with synchronization through volume preservation, as noted by **DeKoning** (Column 2, lines 1-5).

Regarding claim 20, **Milillo** and **Veritas** do not explicitly teach a computer readable medium comprising:

A) wherein said preserving further comprises creating one or more PIT copies of the second data volume prior to refreshing the second data volume to the data of the first data volume.

DeKoning, however, teaches **"wherein said preserving further comprises creating one or more PIT copies of the second data volume prior to refreshing the second data volume to the data of the first data volume"** as "An incremental snapshot of the mirrored data is generated on the secondary storage device at the predetermined checkpoint indicated by the checkpoint message...Thus, the incremental snapshot maintains the storage state of the secondary storage device at the predetermined checkpoint" (Column 2, lines 59-67-Column 3, lines 10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **DeKoning's** would have allowed **Milillo's** and **Veritas's** to improve efficiency in dealing with synchronization through volume preservation, as noted by **DeKoning** (Column 2, lines 1-5).

Regarding claim 21, **Milillo** does not explicitly teach a computer readable medium comprising:

A) wherein one of the PIT copies of the second data volume is in the virtual state when the second data volume is refreshed to the data of the first data volume.

Veritas, however, teaches **"wherein one of the PIT copies of the second data volume is in the virtual state when the second data volume is refreshed to the data of the first data volume"** as "1. Create snapshot mirrors: Use vxassist snapstart to create snapshot mirrors of one ore more volumes... Use vxassist snapshot to create snapshot volumes from the snapshot mirrors" (Page 10, Section: Implementing Point-in Time Copy Solutions on a Primary Host).

The examiner notes that it is clear that **Veritas** has the snapshot volume refreshed to the state of the snapshot mirror, wherein the snapshot mirror is a point-in-time copy of the volume.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **Veritas's** would have allowed **Milillo's** to provide a method to improve efficiency in resynchronization by applying changes to only the updates a mirror has missed, as noted by **Veritas** (Page 7, Section: FastResync of Volume Snapshots).

Regarding claim 26, **Milillo** and **Veritas** do not explicitly teach a method comprising:

A) wherein said preserving comprises creating a PIT copy of the second data volume before or while refreshing the second data volume to the data of the first data volume.

DeKoning, however, teaches **"wherein said preserving comprises creating a PIT copy of the second data volume before or while refreshing the second data volume to the data of the first data volume"** as "An incremental snapshot of the

mirrored data is generated on the secondary storage device at the predetermined checkpoint indicated by the checkpoint message...Thus, the incremental snapshot maintains the storage state of the secondary storage device at the predetermined checkpoint" (Column 2, lines 59-67-Column 3, lines 10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of the cited references because teaching **DeKoning's** would have allowed **Milillo's** and **Veritas's** to improve efficiency in dealing with synchronization through volume preservation, as noted by **DeKoning** (Column 2, lines 1-5).

Response to Arguments

12. Applicant's arguments with respect to claims 1, 4-13, 15, and 18-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,665,815 issued to **Goldstein et al.** on 16 December 2003. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

U.S. Patent 6,611,901 issued to **Micka et al.** on 26 August 2003. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

U.S. Patent 6,799,258 issued to **Linde et al.** on 28 September 2004. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

U.S. Patent 5,875,479 issued to **Blount et al.** on 23 February 1999. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

U.S. Patent 6,338,114 issued to **Paulsen et al.** on 08 January 2002. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

Article entitled "VERITAS FlashSnap: Using VERITAS FlashSnap to Protect Application Performance and Availability, by: **VERITAS**, dated 05/14/2002. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

Article entitled "VERITAS FlashSnap: Guidelines for Using VERITAS FlashSnap, by: **VERITAS**, dated 05/01/2002. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

U.S. Patent 7,085,901 issued to **Homma et al.** on 01 August 2006. The subject matter disclosed therein is pertinent to that of claims 1,5-13, 15, and 18-26 (e.g., methods to spur synchronization via snapshots amongst varied data volumes).

Contact Information

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahesh Dwivedi whose telephone number is (571) 272-2731. The examiner can normally be reached on Monday to Friday 8:20 am – 4:40 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Gaffin can be reached (571) 272-4146. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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